UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

A N N U A L R E P O R T

ON

THE CONTROL OF WHITE PINE BLISTER RUST

IN CALIFORNIA

FOR THE CALENDAR YEAR 1961

U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
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BLISTER RUST CONTROL IN CALIFORNIA - 1961

By
Neil J. MacGregor, Forester

The white pine blister rust control program in California has three interrelated objectives: indirect control of the disease by means of ribes suppression, direct control through the use of chemical fungicides applied directly to infected trees, and the development of rust-resistant sugar pine hybrids. At the present time selected white pine stands in California are protected principally through the suppression of ribes populations. These plants, which are alternate hosts for the disease, are eradicated mainly by hand grubbing; most of the work is performed under contract. A small amount of eradication work is done in lightly populated stands by hired technicians who also conduct various operational surveys designed to select protection units, to determine the need for ribes suppression, to measure compliance with contract specifications, and to determine the extent and severity of rust spread.

The use of chemical fungicides to treat infected trees is a recent development, and field testing in California has not yet progressed to the point at which large-scale operational applications are possible. This method of control is highly effective on western white pine in northern Idaho and western Montana, and there have been encouraging results from the tests conducted in California since 1958.

The development of rust-resistant hybrids is a long-term genetics project being conducted as a part of the Region's over-all tree improvement program. Over 100 naturally resistant candidates have been located in heavily infected stands. These are being tested for their ability to pass on to their progeny a degree of this resistance.

BLISTER RUST CONTROL IS A COOPERATIVE UNDERTAKING

The control of white pine blister rust in California involves the cooperation of several State and Federal agencies and numerous representatives of California's forest industry. The cooperators and their principal roles in the program are:

THE STATE OF CALIFORNIA

Through its continued interest and substantial financial support the State of California makes possible the protection of sugar pine stands on more than 200,000 acres of privately owned forest land. Although financial participation by private owners is voluntary, many contribute. Their contribution plus the Federal appropriation is matched by the State. Where the owner does not contribute financially, but agrees to manage the stand for sugar pine production, the State and Federal Government share the cost of protection.

About 12,000 acres of State forests and parks are included in protection units; here the work is financed entirely by the State. Control operations on State and private lands are carried out by the Forest Service under a cooperative agreement with the State of California. Nine National Forests perform the work with technical assistance and coordination from the Regional Office of the Forest Service in San Francisco and from the California Division of Forestry. The University of California is also an active participant in the program. Control accomplishments on State and private lands are reported in the accompanying tables under the heading, "Work Done by the State Cooperative Project."

INDUSTRY

Individual forest landowners in California may participate directly by entering cooperative agreements under which control operations are carried out. They are encouraged to contribute up to 25 per cent of the cost of control.

California's forest industry participates indirectly through the California Forest Pest Control Action Council, which periodically reviews progress of the blister rust control program and makes appropriate recommendations to the State Board of Forestry.

NATIONAL PARK SERVICE

The National Park Service has selected for protection outstanding white pine stands throughout the three National Parks in California. At the present time these units, in which five species of white pine are represented, comprise 163,000 acres. Control work is done by the individual Parks with the technical assistance of the Forest Service.

FOREST SERVICE

The Forest Service's primary responsibility in blister rust control is for over-all leadership, technical direction and coordination. This is provided by the Division of Timber Management of the San Francisco Regional Office, and the Division of Forest Disease Research of the Pacific Southwest Forest and Range Experiment Station in Berkeley. In addition ten National Forests have active sugar pine management programs which include blister rust control. At present the National Forest sugar pine management units include 288,000 acres.

RIBES ERADICATION AND SURVEYS

Control operations totalling 120,000 acres were inactive in 1961 as a result of the 1960 decision to defer further ribes suppression in the Sierra and Sequoia National Forests, Sequoia and Kings Canyon National Parks, and Mountain Home State Forest; consequently, reported accomplishments appear noticeably lower than in 1960.

In 1961 ribes were eradicated from nearly 24,000 acres of State, Federal, and privately owned land, and 119,000 acres were surveyed. Most of the eradication work was done by contractors at an average price of $6.83 per acre. An 18-man inmate crew operating out of Magalia completed 1,643 acres of work on private land. Nearly all of the remaining ribes eradication was maintenance work, which is more efficiently done by hired technicians.

STATE FORESTS AND PARKS

Work on Latour State Forest consisted of a single 63-acre contract for initial work, plus a small amount of ribes eradication and survey work by hired technicians. In D. L. Bliss State Park, since most of the control unit is on maintenance and little ribes regeneration is taking place, only two technicians were needed in 1961. They removed regrowth of ribes in several spots, which will require further attention. No work was needed in either Calaveras State Park or the University of California's Blodgett Forest.

LASSEN VOLCANIC NATIONAL PARK

Although 585 acres of difficult initial ribes eradication was completed by contractors in the Warner Valley unit, the Lassen Park control program in 1961 emphasized inspection and treatment of maintenance and near-maintenance units by hired technicians. Altogether, surveys were made on 3,289 acres and ribes were removed from 2,450 acres. Much of the ribes eradication was in portions of the Hat Mountain, Helen Lake, and Reading Peak units that proved to require little attention, and may be considered in a permanent maintenance status. As a part of a program to assess over-all blister rust needs, Lassen Park in 1961 initiated a white pine stocking survey to delineate all stands within the Park needing protection. During the first year of the survey 2,000 acres were covered.

YOSEMITE NATIONAL PARK

The program of suppressing ribes populations to protection levels is largely complete, and control work in Yosemite Park will soon be almost entirely concerned with maintaining rather than achieving control. Much control acreage needs no further treatment under the new control policy calling for relaxed ribes suppression standards on central Sierra control operations. For these reasons Yosemite foresters have been re-examining control units to delineate the inactive portions in which no further control work is needed. In 1961 2,216 acres were added to maintenance and 6,895 were classified as inactive. Most of the 1961 control work was done by a 12-man crew of technicians who made surveys, inspected contract work, and eradicated ribes from lightly populated work blocks; 1,681 acres were worked and 1,495 acres were surveyed. Three contractors completed an additional 550 acres at an average bid price of $5.12 per acre.

NATIONAL FOREST OPERATIONS

The field operations needed to carry out the State Cooperative and National Forest Projects are identical and frequently involve intermingled lands; for this reason the two projects are conducted as a single integrated operation by individual National Forests. In 1961 ribes were eradicated from nearly 9,000 acres of private and 10,000 acres of National Forest land. Most of the work was done by contractors at an average cost of $6.56 per acre, which is somewhat lower than in recent years. Surveys during the year covered about 113,000 acres.

DIRECT CONTROL

The testing of chemical fungicides and the development of operational means of the direct treatment of infected white pines remained a high priority project in the California Region.

RESULTS OF 1959 TESTS

All of the several hundred test trees that were treated in 1959 and 1960 were examined closely by Klamath National Forest specialists, who rated individual cankers as to the effect of treatment. Analysis of the results is not yet complete but several observations of a general nature are possible regarding the antibiotic, Acti-dione.

1. When applied directly to the canker, Acti-dione produces a moderate to pronounced effect on a high proportion of the cankers treated. This effect ranges from a reduction in canker growth and sporulation to an apparent complete kill of the parasite.

   The 1961 readings of the 1959 tests in which Acti-dione was applied directly to 133 bole cankers yielded the following information: 68 per cent of the cankers were rated as "apparently dead" or showing a "pronounced" effect; 32 per cent were rated as showing "none to slight" effect. Only 20 per cent of the treated cankers had sporulated in 1961.

2. The 1961 results of the 1959 basal stem tests with Acti-dione (low concentrations, varying dosages, and pearl oil for a diluent) were spotty. Evidence of translocation was abundant, and on many trees cankers at distant points were apparently dead; in others there was no discernible effect. One-third of the treated bole cankers had sporulated to some extent in 1961, but another third showed a "pronounced effect," and one-fifth were "apparently dead."

3. There was no significant damage to test trees when Acti-dione was applied liberally to the lower bole at concentrations as high as 600 ppm using stove oil and diesel oil as diluents.

With present experience it appears to take two or more years to get conclusive readings on fungicide tests, and the readings of the 1960 tests are too tentative for detailed summarization. There is, however, a general pattern of greater effectiveness from these tests, that employed higher concentrations of fungicides and both stove and diesel oil.

During 1961 the Klamath National Forest made further fungicide tests of the same sort carried out in 1960.

AN OPERATIONAL APPLICATION OF ACTI-DIONE

The Shasta-Trinity National Forests carried out an administrative test of direct control to determine the effectiveness of Acti-dione when employed operationally, and to acquire experience with this method of control. A rectangular 100-acre tract of second-growth sugar pine in the Lookout Point management unit was subdivided into ten 10-acre work blocks. In half of these, infected crop trees were preselected for treatment. In the alternate blocks every crop tree was treated whether infected or not.

Acti-dione in stove oil at a concentration of 300 ppm was applied with back-pack sprayers. The basal stem procedure was used throughout. In the premarked blocks four trees per acre were treated at a field-level cost for labor and materials of $5.00 per acre. Where both infected and uninfected trees were sprayed, 60 trees per acre were treated at a cost of $20.00 per acre. All premarked trees were permanently marked for future study, and a single indicator canker was selected on each.

AN AERIAL APPLICATION OF PHYTOACTIN

In October a 10-acre test plot in the Shasta-Trinity National Forests was sprayed from the air with Phytoactin L-318. The antibiotic was applied from a helicopter at the rate of 7.5 grams per acre in a 20 per cent stove oil and water emulsion (7 gallons per acre). Fifty indicator trees selected for future study were carefully examined and described before treatment.

A biologist of the United States Department of the Interior, Fish and Wildlife Service, made a number of tests to determine the effect of aerial spray on the wildlife of the area. Aerial spraying will be further tested in the spring of 1962.

RUST-RESISTANT SUGAR PINE

The program for the development of rust-resistant sugar pine hybrids was continued in 1961. The first wind-pollinated progeny from resistant candidate trees was outplanted on the Klamath National Forest to test their resistance under severe natural infection conditions. The first seeds from controlled pollinations were planted at the Placerville Nursery on the Eldorado Forest. In 1962 half of these seedlings will be outplanted and the other half will receive artificial inoculation at the Nursery.

A higher proportion of successful grafts resulted when trees were subjected to a routine of intermittent mist sprays under controlled greenhouse conditions. In searching for rust-resistant candidates emphasis is now given to trees of cone-bearing age; several more candidates were located in Northern California.

RUST SPREAD AND INTENSIFICATION IN 1961

There was comparatively little spread from pine to ribes in the spring of 1961, and it is thought that ribes-to-pine spread in the fall was equally light. No new infection centers were reported in either the Sierra Nevada or the Coast Range that would extend the southern limits of rust penetration. Within the present zone of infection the disease continued to build up rapidly on white pine wherever conditions exist that especially favor its development. Intensification of this type is common in northwestern California. In the southern Cascade and northern Sierra Nevada Ranges heavy infection occurs less frequently. In the central Sierra and the Coast Ranges infection centers become increasingly less frequent and severe from north to south. The southernmost centers yet reported are on Gualala Peak, Mendocino County, and Dodge Ridge, Tuolumne County. Ribes from the Middle Fork of the American River to the Merced River were heavily infected with pinyon rust in 1961.

TABLE 1

STATUS OF RIBES ERADICATION IN CALIFORNIA AS OF DECEMBER 31, 1961

Ownership	Control Operation	Control Units		Status of Ribes Eradication			
				Net Acres by Workings			Acres on Maint.
		Total Acres	Acres Unworked	Initial	Reerad.	Maint. Work	
WORK DONE BY THE STATE COOPERATIVE PROJECT							
PRIVATE LAND	Mendocino (Glenn County)						
	Klamath (Siskiyou County)	2,300		2,300	3,974	2,187	2,300
	Shasta-Trinity (Siskiyou and Shasta Counties)	4,315	71	4,244	5,189	72	220
	Modoc (Siskiyou and Modoc Counties)	8,489	4,387	4,102	366		579
	Lassen (Tehama, Butte, Plumas, and Shasta Counties)	105,126	24,487	80,639	91,058	2,907	53,087
	Plumas (Plumas, Butte, Yuba, and Sierra Counties)	25,189	2,858	22,331	43,445	40	
	Tahoe (Sierra, Nevada, and Placer Counties)	1,935		1,935	1,350		244
	Eldorado (Eldorado, Placer, and Amador Counties)	41,798	7,646	34,152	68,400	137	8,320
	Stanislaus (Calaveras and Tuolumne Counties)	8,112	316	7,796	19,193	70	4,298
	Sierra * (Mariposa, Madera, and Fresno Counties)	14,422	1,285	13,137	12,009	66	620
	TOTAL	211,686	41,050	170,636	244,984	5,479	69,668
STATE LAND	Latour State Forest	3,109	863	2,246	1,888	53	1,014
	Blodgett Forest-Univ. of Calif.	940		940	2,859		
	D. L. Bliss-Emerald Bay State Parks	2,280	40	2,240	89		1,203
	Calaveras Big Trees State Park	5,073	814	4,259	10,230		3,061
	Mountain Home State Forest *	878	130	748	395		
	TOTAL	12,280	1,847	10,433	15,461	53	5,278
TOTAL STATE AND PRIVATE		223,966	42,897	181,069	260,445	5,532	74,946
WORK DONE BY THE FOREST SERVICE							
NATIONAL FOREST LAND	Mendocino	7,850	6,603	1,247	1,040		
	Klamath	2,238		2,238	2,326	765	2,238
	Shasta-Trinity	12,169	955	11,214	6,063	105	321
	Modoc						
	Lassen	41,176	23,108	18,068	13,153	552	6,884
	Plumas	68,543	19,297	49,246	70,366	990	2,066
	Tahoe	21,012	1,386	19,626	15,904		3,162
	Eldorado	37,319	8,510	28,809	41,135	10	4,941
	Stanislaus	43,603	910	42,693	95,651	680	25,631
	Sierra *	49,578	19,293	30,285	44,415	51	500
	Sequoia *	4,974		4,974	3,609		560
	TOTAL	288,462	80,062	208,400	293,662	3,153	46,303
WORK DONE BY THE NATIONAL PARK SERVICE							
NATIONAL PARK LAND	Lassen Volcanic	26,784	394	26,390	28,032	4,270	23,720
	Yosemite	85,697	3,523	82,174	110,715	12,471	59,475
	Sequoia-Kings Canyon*	50,576	2,400	48,176	59,661	8,322	42,667
	TOTAL	163,057	6,317	156,740	198,408	25,063	125,862
ALL WORK DONE IN CALIFORNIA							
ALL CONTROL OPERATIONS		675,485	129,276	546,209	752,515	33,748	247,111

* Inactive control operations. Data are as of December 31, 1960.

Ownership	Control Operation	Acres Worked	Eradication Man Days	Thousands of Ribes Destroyed	Acres Surveyed	Contract Eradication: Acres Worked	Contract Eradication: Average Price Per Acre Paid to Contractor
WORK DONE BY STATE COOPERATIVE PROJECT							
PRIVATE LAND	Klamath (Siskiyou County)	40	17	1			
	Shasta-Trinity (Siskiyou and Shasta Counties)	642	255	13	2,181	588	$5.57
	Modoc (Siskiyou and Modoc Counties)	986	204	31	4,991	702	4.82
	Lassen (Tehama, Butte, Plumas, and Shasta Counties)	5,469	2,011	371	22,733	2,326	5.96
	Plumas (Plumas, Butte, Yuba, and Sierra Counties)	1,121	617	304	9,764	1,081	8.86
	Tahoe (Sierra, Nevada, and Placer Counties)	174	46	9	334	174	6.47
	Eldorado (Eldorado, Placer, and Amador Counties)	295	69	8	3,657	158	5.85
	Stanislaus (Calaveras and Tuolumne Counties)	213	89	230	1,666	163	19.01
	Sierra * (Mariposa, Madera, and Fresno Counties)						
STATE LAND	Latour State Forest	134	28	2	650	63	4.11
	Blodgett Forest-Univ. of Calif.						
	D. L. Bliss-Emerald Bay State Parks	89	41	4			
	Calaveras Big Trees State Park						
	Mountain Home State Forest *						
ALL WORK DONE BY THE STATE COOPERATIVE PROJECT	Initial	2,589	1,306	406			
	Reeradication	4,723	1,893	551			
	Maintenance	1,851	178	16			
	All	9,163	3,377	973	45,976	5,255	$6.76
WORK DONE BY THE FOREST SERVICE							
NATIONAL FOREST LAND	Mendocino	100	40	15	39		
	Klamath						
	Shasta-Trinity	1,478	441	51	2,130	1,045	6.98
	Modoc						
	Lassen	1,520	450	96	16,996	1,271	5.41
	Plumas	2,240	547	102	27,493	1,645	8.56
	Tahoe	1,099	340	204	8,799	1,099	7.58
	Eldorado	993	218	82	6,590	993	3.98
	Stanislaus	2,975	684	265	5,727	2,564	6.23
	Sierra *						
	Sequoia *						
ALL WORK DONE BY THE FOREST SERVICE	Initial	2,726	966	285			
	Reeradication	6,363	1,484	513			
	Maintenance	1,316	270	17			
	All	10,405	2,720	815	67,774	8,617	$6.56
WORK DONE BY THE NATIONAL PARK SERVICE							
NATIONAL PARK LAND	Lassen Volcanic	2,450	639	30	3,289	585	12.97
	Yosemite	1,681	460	23	1,495	550	5.12
	Sequoia-Kings Canyon *						
ALL WORK DONE BY THE NATIONAL PARK SERVICE	Initial	606	470	24			
	Reeradication	993	273	16			
	Maintenance	2,532	356	13			
	All	4,131	1,099	53	4,784	1,135	$9.17
ALL WORK DONE IN CALIFORNIA							
ALL OWNERSHIPS ALL AGENCIES	Initial	5,921	2,742	715			
	Reeradication	12,079	3,650	1,080			
	Maintenance	5,699	804	46			
	All	23,699	7,196	1,841	118,534	15,007	$6.83

* Inactive control units.

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